CHARACTERIZATION OF WATERBASED PU USING DIFFERENT RATIO MDI/PEG & EFFECT ON EXPOSURE TO SUNLIGHT

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ABSTRACT

CHARACTERIZATION OF WATERBORNE POLYURETHANE COATING USING DIFFERENT RATIO PMDI/MDI WITH PEG AND EFFECT ON EXPOSURE TO SUNLIGHT

Waterborne polyurethane (PU) was synthesized by reacting PMDI/MDI and PEG with varying ratio of isocyanate; 1.5:1, 2.0:1, 2.5.1 and 3.0:1. The structural were analyzed using FT-IR and UV/VIS Spectrophotometer and the melting point,T_m and latent heat of fusion of the polymer were determined by using DSC. There is an obvious association peak appeared at 3460-3490 cm^{-1}, which was characteristic of stretching vibration of N-H group in the urethane linkage. The peak about 2280 cm^{-1} is the interest peak to be observed which contributes to the isocyanate group of PMDI/MDI which observed in the freshly prepared sample gradually decrease over time as curing process. Bathchromic shifts in the UV spectra were observed as MDI was converted into urethane. The UV absorption peaks of PU appeared at 285 nm due to the $\pi \rightarrow \pi^*$ transition. When a hydroxyl group reacted with the NCO group, the resonance structure of the isocyanate group was destroyed. The transition enthalpy of the polymeric solid PUs are not consistent before the exposure compare to the after the exposure, the highest of them was 327.053 J/g for the ratio NCO: OH = 1.5:1 with T_m 166.666°C; furthermore, most of them were more above 200 J/g. The highest enthalpy of PU after exposure is 284.555 J/g for the ratio NCO: OH = 3.0:1 with T_m 161.337°C. After exposure to the sunlight, there is gradual decrease of T_m from ratio 1.5:1 to 3.0:1; however, the enthalpy of the PU for after exposure to the sunlight decreases with increasing ratio of isocyanate group affecting crystallinity of PU due to less urethane linkage in the polymer.